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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,531	09/22/2003	David R. Brown	MEMS-0196-US	5924
40575	7590	11/28/2005	EXAMINER	
OLDS, MAIER & RICHARDSON, PLLC PO BOX 20245 ALEXANDRIA, VA 22320-1245			CHACKO DAVIS, DABORAH	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 11/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/665,531	Applicant(s) BROWN, DAVID R.	
	Examiner Daborah Chacko-Davis	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-4, 6-8, 10-12, 15, 17-19, 21, 30-31, and 34, are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent Application Publication No. 2002/0045105 (Brown et al, herein after referred to as Brown).

Brown, in the abstract, in [0023], [0025], [0048], [0049], [0051], [0052], [0053], [0054], [0055], discloses a method or reducing errors (reducing seam lines) in lithographic processes comprising providing a substrate, applying a photosensitive material on the substrate (surface to be patterned), providing energy sources as irradiation sources (for multiple pass writing), providing a mask (gray scale mask with a pattern to be defined on the substrate, mask is replicated on the substrate to form a repeating gray scale pattern, using multiple passes that are offset) defining a pattern to be replicated on the substrate, performing a first pass to partially expose a first portion on the photosensitive layer and positioning the mask offset at a small distance so as to perform multiple passes (upto nth sweep) such that no two passes write along the same path, and repeating the passes to form a final desired structure (continuously but

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partially exposing the entire photosensitive layer, forming a desired substrate contour), resulting in the reduction of stitching errors (reducing seam lines) (claims 1, 10, 30, and 34). Brown, in [0051], discloses that the number of sweeps (passes) can be about 2, or 4 (claims 2-3). Brown, in [0051], discloses that each pass of the multiple passes is offset a certain amount ($1/8$, where 8 is the no. of passes performed such that no two passes write along the same path i.e., $1/n$ of the pattern size for "n" no. of sweeps) (claims 4, and 15). Brown, in [0048], discloses that the mask is a gray scale mask (claims 6, 17, and 31). Brown, in [0010], discloses that the mask is formed of a High Energy Beam Sensitive (HEBS) glass (claims 7, and 18). Brown, in [0052], [0053], [0054], discloses that the gray scale mask is formed by writing the mask with a laser or electron beam energy source (claims 8, and 19). Brown, in [0056], discloses developing the photosensitive layer followed by exposure (developing removes a portion of the photosensitive layer), heating the remaining the photosensitive layer and etching the substrate (under the photosensitive pattern) to form a microstructure (solid structure) (claims 11-12). Brown, in [0020], [0022], [0025], discloses forming an array of microstructures with minimum lithographic errors arising from stitching errors (seam lines) (claim 21).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 9, and 20, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0045105 (Brown et al., herein after referred to as Brown) in view of U. S. Patent Application Publication No. 2002/0146627 (Suleski et al., herein after referred to as Suleski).

Brown, in [0053], and [0054], discloses that a binary mask can be used for exposing the photosensitive material.

The difference between the claims and Brown is that Brown does not disclose that the binary mask modulates a defocused irradiation to expose the photosensitive layer and that the illumination is varied in its intensity (claims 9, and 20).

Suleski, in the abstract, in [0013], [0014], and [[0054], discloses that binary masks with variable transmissions are employed for exposure, and that the photoresist material (photosensitive material) are irradiated with defocused light (defocused irradiation).

Therefore, it would be obvious to a skilled artisan to modify Brown by employing the method of varying the transmission of the defocused exposure light as taught by Suleski because Suleski, in [0014], [0033], and [0054], discloses that using the binary mask to vary transmission of the defocused light during exposure enables better control of sidewall sharpness and actual depth during gray scale mask fabrication.

5. Claims 5, 16, and 32-33, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0045105 (Brown et al., herein after referred to as Brown) in view of U. S. Patent No. 6,449,399 (Nakasuji).

Brown is discussed in paragraph no. 2.

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Brown, in [0047], and [0048], discloses that multiple pass writing is employed to pattern the photosensitive material in order to eliminate stitching errors (seam lines).

The difference between the claims and Brown is that Brown does not disclose that the edge of the mask is intentionally meandered (claims 5, and 16). Brown does not disclose that the meandering of the meandering edge portions are periodic and that the period of meandering is substantially smaller, at least an order of magnitude smaller than the dimension of the mask (claims 32-33).

Nakasuji, in col 2., lines 33-47, in and in col 6, lines 13-40, discloses a reticle that has edges that are intentionally meandered (sub-fields, reference 91 of figure 5(B)).

Nakasuji, in col 6, lines 13-64, in col 7, lines 26-29, and in figure 5 (B), discloses that a reticle with all of the edges (all outer edges of the reticle) as intentionally meandering edges (subfields, reference 91), that are periodic with a period that is less than the dimension of the mask (the skirts (references 91, and 93 of figures 5(B), and 5(C)) in the reticle are not imaged or exposed, significantly smaller than the dimension of the mask).

Therefore, it would be obvious to a skilled artisan to modify Brown by employing the mask with subfields (meandered edges) as taught by Nakasuji, because Nakasuji, in col 2, lines 29-47, and in col 7, lines 26-31, discloses that using reticles with subfields (with meandering edges) for exposure results in the formation of pattern images that are contiguous and are properly stitched together such that defects arising from subfield stitching errors are reduced.

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6. Claims 13-14, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0045105 (Brown et al., herein after referred to as Brown) in view of U. S. Patent NO. 5,045,438 (Adachi).

Brown is discussed in paragraph no. 2.

The difference between the claims and Brown is that Brown does not disclose electroplating the substrate contour to form a master (claim 13). Brown does not disclose that the master is used for molding a desired contour (claim 14).

Adachi, in col 3, lines 65-68, and in col 4, lines 1-10, and lines 63-68, in col 5, lines 1-4, discloses electroplating the substrate with the pattern to form a stamper (master) and using the stamper (as a mold) to perform molding.

Therefore, it would be obvious a skilled artisan to modify Brown by employing the electroplating process to form a master as taught by Adachi because Brown, in [0057], discloses that a master can be formed from the pattern formed on the photosensitive material, and Adachi, in col 3, lines 35-55, discloses that such process enables reduced or almost negligible tracking error and read error in reproducing or recording procedure.

7. Claims 22-25, and 27-29, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0045105 (Brown et al., herein after referred to as Brown) in view of U. S. Patent No. 6,449,399 (Nakasuji).

Brown, in the abstract, in [0023], [0025], [0048], [0049], [0051], [0052], [0053], [0054], [0055], discloses reducing seam lines (stitching errors) in lithographic processes comprising providing a substrate, applying a photosensitive material on the substrate

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(surface to be patterned), providing energy sources as irradiation sources (for multiple pass writing), and by providing a mask (gray scale mask with a pattern to be defined on the substrate, mask is replicated on the substrate to form a repeating gray scale pattern, using multiple passes that are offset) defining a pattern to be replicated on the substrate, performing a first pass to partially expose a first portion on the photosensitive layer and positioning the mask offset at a small distance so as to perform multiple passes (upto nth sweep) such that no two passes write along the same path, and repeating the passes to form a final desired structure (continuously but partially exposing the entire photosensitive layer, forming a desired substrate contour), resulting in the reduction of stitching errors (reducing seam lines) (claim 22). Brown, in [0048], discloses that the mask is a gray scale mask (claim 23). Brown, in [0010], discloses that the mask is formed of a High Energy Beam Sensitive (HEBS) glass (claim 24). Brown, in [0052], [0053], [0054], discloses that the gray scale mask is formed by writing the mask with a laser or electron beam energy source (claim 25).

The difference between the claims and Brown is that Brown does not disclose that the mask has opposed first and second intentionally meandering edge portions. Brown does not disclose that all of the edge portions of the mask are intentionally meandering edge portions (claim 27). Brown does not disclose that the meandering of the meandering edge portions are periodic and that the period of meandering is substantially smaller, at least an order of magnitude smaller than the dimension of the mask (claims 28-29).

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Nakasuji, in col 6, lines 13-64, in col 7, lines 26-29, and in figure 5 (B), discloses that a reticle with all of the edges (all outer edges of the reticle) as intentionally meandering edges (subfields, reference 91), that are periodic with a period that is less than the dimension of the mask (the skirts (references 91, and 93 of figures 5(B), and 5(C)) in the reticle are not imaged or exposed, significantly smaller than the dimension of the mask).

Therefore it would be obvious to a skilled artisan to modify Brown by employing the mask with subfields (meandered edges) as taught by Nakasuji, because Nakasuji, in col 2, lines 29-47, and in col 7, lines 26-31, discloses that using reticles with subfields (with meandering edges) for exposure results in the formation of pattern images that are contiguous and are properly stitched together such that defects arising from subfield stitching errors are reduced.

8. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0045105 (Brown et al., herein after referred to as Brown) in view of U. S. Patent No. 6,449,399 (Nakasuji) as applied to claims 22-29 above, and further in view of U. S. Patent Application Publication No. 2002/0146627 (Suleski et al., herein after referred to as Suleski).

Brown in view of Nakasuji is discussed in paragraph no. 6.

Brown, in [0053], and [0054], discloses that a binary mask can be used for exposing the photosensitive material.

The difference between the claims and Brown in view of Nakasuji is that Brown in

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view of Nakasuji does not disclose that the binary mask modulates a defocused irradiation to expose the photosensitive layer and that the illumination is varied in its intensity (claim 26).

Suleski, in the abstract, in [0013], [0014], and [[0054], discloses that binary masks with variable transmissions are employed for exposure, and that the photoresist material (photosensitive material) are irradiated with defocused light (defocused irradiation).

Therefore, it would be obvious to a skilled artisan to modify Brown in view of Nakasuji by employing the method of varying the transmission of the defocused exposure light as taught by Suleski because Suleski, in [0014], [0033], and [0054], discloses that using the binary mask to vary transmission of the defocused light during exposure enables better control of sidewall sharpness and actual depth during gray scale mask fabrication.

Conclusion


9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent

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Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd


November 21, 2005.


JOHN A. MCPHERSON
PRIMARY EXAMINER